Melanoma in Virginia
1970-1996

Virginia Department of Health
E. Anne Peterson, MD, MPH
Acting Commissioner

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Virginia Cancer Registry
Office of Epidemiology
P.O. Box 2448, Room 114
Richmond, Virginia 23218

http://www.vdh.state.va.us/epi/vcr.htm

TEL (804) 786-1668
FAX (804) 371-4061

Contributors

Principal Author

Sarah L. W. Norris
Statistical Analyst, Senior
Virginia Cancer Registry

Contributing Editors

Amy M. Pugh, MA
Director
Virginia Cancer Registry

Diane Woolard, PhD, MPH
Director, Division of Disease
Surveillance and Investigation
Office of Epidemiology
Virginia Department of Health

Craig L. Slingluff, Jr., MD
Associate Professor of Surgery
Chief, Division of Surgical Oncology
University of Virginia

Virginia Cancer Registry Staff

Bonita Bryant, CTR
Medical Records Technician, Senior

Bonnie Perry, ART
Medical Records Technician, Senior

Leona Rowe, CTR
Medical Records Technician, Senior

Phillip Jones, CTR
Medical Records Technician, Senior

Vivian Purnell
Program Support Technician

Melinda Swingle, CTR
Medical Records Technician, Senior

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Forward

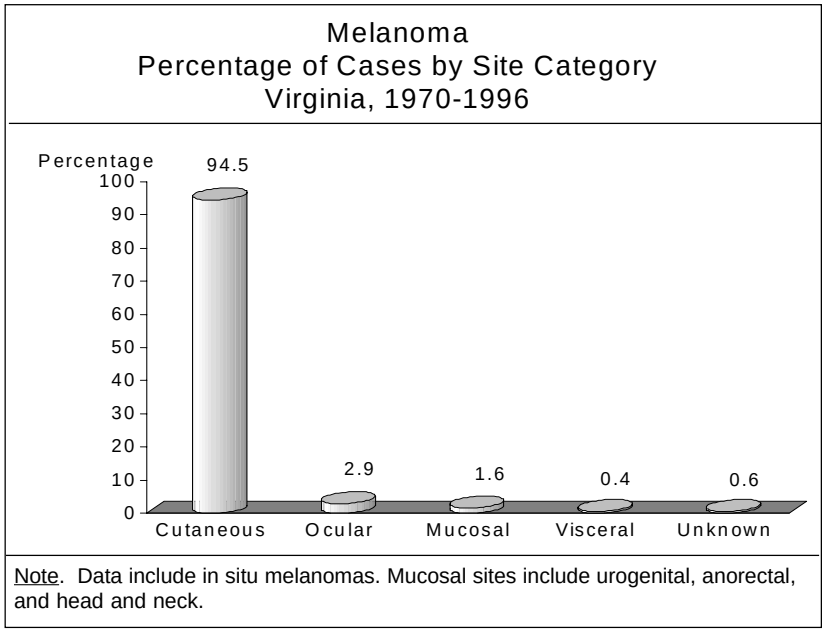
Malignant melanoma is increasing in incidence faster than any other cancer in this country, and it continues to affect a disproportionate number of young adults. The Virginia Cancer Registry's *Melanoma in Virginia, 1970-1996* is presented as a summary of Virginia's experience with this difficult disease over the past several decades. This registry is population-based and thus includes information that is otherwise difficult to obtain from reports made by melanoma clinics at tertiary care hospitals. Survival data are included, in addition to information about the initial staging and treatment of patients with melanoma. In addition to summaries of current data, the report includes recommendations for collection of additional data in the future, in order to facilitate future studies of this important patient database.

CRAIG L. SLINGLUFF, JR., M.D.

Introduction

Melanoma is a cancer of melanocytes, cells that produce and transport melanin. Melanin is the substance responsible for pigmentation of various organs. Although melanoma most often arises in the skin, it can also appear in ocular sites and mucosal surfaces such as the pharynx and sinuses, the genitals, and the anorectal region. As Figure 1 shows, 94.5% of Virginia melanoma cases occurred in the skin; therefore this site study focuses exclusively on cutaneous malignant melanoma, also known as melanoma of the skin.

Figure 1



Note. Data include in situ melanomas. Mucosal sites include urogenital, anorectal, and head and neck.

Melanoma of the skin has received increased attention in recent years from both medical researchers and the media. In 1999, an estimated 44,200 Americans will be diagnosed with melanoma of the skin, and 9,200 Americans are expected to lose their lives as a result of the disease.[1] Nationally, melanoma typically represents 3.1% of all new cancer cases and 1.3% of all cancer-related deaths each year.[2] Melanoma incidence rates in the U.S. have increased over 130% during the past 25 years, from 5.7 cases per 100,000 persons in 1973 to 13.3 cases per 100,000 persons in 1995. Mortality rates from melanoma have also increased, from 1.6 deaths per 100,000 persons in 1973 to 2.2 deaths per 100,000 persons in 1995. Unlike most other cancers, cutaneous melanoma frequently affects younger adults, aged 35-64; over two-thirds of all melanoma are diagnosed before age 65.

This report of the Virginia Cancer Registry (VCR) examines the occurrence of cutaneous malignant melanoma in Virginia residents between 1970 and 1996 and relates trends in detection, treatment, and survival to nationwide patterns. The discussion of these data includes background information on etiology, risk factors, and clinical features of the disease, as well as methods of prevention, diagnosis, and treatment. These analyses will serve three main purposes: (1) document melanoma incidence in the Commonwealth of Virginia, (2) facilitate the assessment by hospitals and communities of their own cancer prevention and treatment efforts, and (3) highlight areas for improved prevention and control efforts. The report concludes with recommendations for future research by Craig Slingluff, MD, Associate Professor of Surgery and Chief of the Division of Surgical Oncology at the University of Virginia.

Methods

The Virginia Cancer Registry has collected demographic and clinical information on cancer patients diagnosed or treated in Virginia since 1970. The VCR became a population-based registry in 1990 when reporting of newly-diagnosed cancer cases was made mandatory for hospitals, clinics, and laboratories.[3] In order to improve the completeness of case reporting to the VCR, in 1998 the Virginia legislature amended the cancer registry law to require reporting by physician offices. Also, data on cancer in Virginia residents diagnosed or treated in the neighboring states of Kentucky, West Virginia, North Carolina, Maryland, or the District of Columbia are collected from the central registries in those states.

Virginia residents selected for study were diagnosed melanoma of the skin according to SEER definition (a tumor of ICD-O-2[4] typography code C44.0-C44.9 and histology code of 8720-8799). While all eligible cases diagnosed between 1970 and 1996 are included in general tables, only population-based data for cases diagnosed between 1990 and 1995 are used for comparison purposes. These statistics provide a more complete assessment of cancer incidence in Virginia, and thus are more appropriate for national comparison. The most recent data from the National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER) and the American College of Surgeon's National Cancer Data Base (NCDB) are included for comparison purposes where appropriate. Data from the SEER program are used to represent national incidence figures. Data from SEER cover the years 1990 to 1995, while data from NCDB were available from 1985 through 1994. In order to exclude cases with inadequate follow-up, survival analysis was performed only for cases diagnosed between 1970 and 1989. Data were analyzed using Rocky Mountain Cancer Data System programs,[5] SPSS statistical software,[6] and SEERPrep[7] and SEERStat[8] cancer data analysis software. Appendix A contains technical notes and information on population estimates, calculation of rates, estimates of completeness, and definitions of terms used.

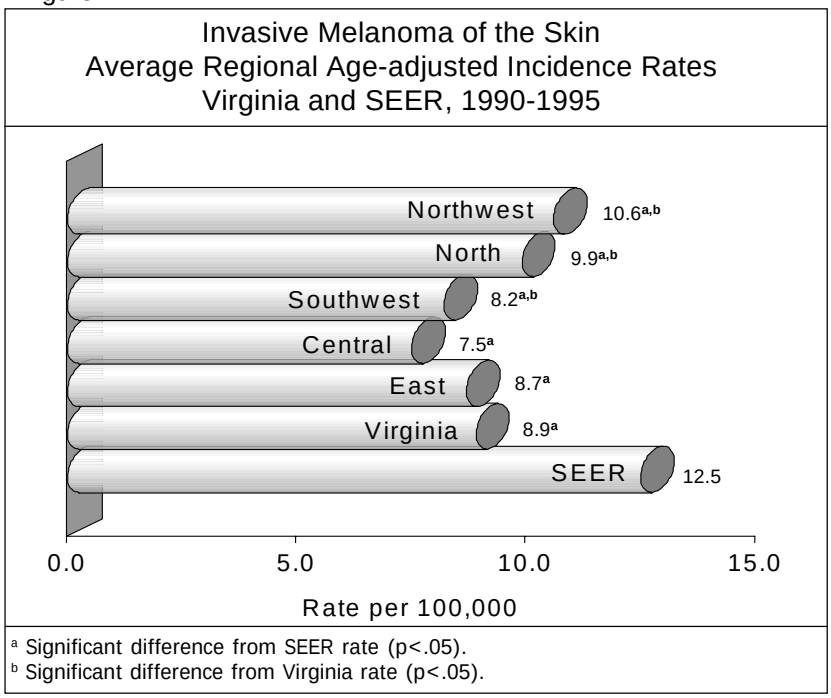
Results

From 1990 to 1996, a total of 5,612 Virginia residents were diagnosed with melanoma, for an average of 802 new cases each year. These melanoma cases accounted for an average of 3.2% of all new cancer cases from during these years. This percentage increased from 2.7 in 1990 to 3.9 in 1996 (See Appendix C, Table C-1). The average annual incidence rate of invasive melanoma was 9.0 cases per 100,000 persons, based on data reported from 1990 to 1996. This invasive melanoma rate increased from 8.3 cases per 100,000 in 1990 to 9.9 cases per 100,000 in 1996.

Geographic Distribution

The localities in Virginia are combined into five health planning regions (See Appendix B). Overall, Virginia had significantly less reported melanoma incidence than the nation (8.9 vs. 12.5 per 100,000, respectively). Figure 2 shows that state and regional average annual age-adjusted rates for 1990-1995 were all significantly lower than SEER rates for the same years. Within Virginia, the Northwest and Northern regions had higher incidence (10.6 and 9.9 per 100,000, respectively) than the state overall (8.9 per 100,000), but both were still below the national incidence figures (12.5 per 100,000). The Central health planning region incidence rate, meanwhile, was significantly lower than even Virginia's rate during these years (7.5 to 8.9 per 100,000, respectively). Detailed annual regional rate comparisons and health district comparisons are provided in Tables C-2 and C-3 in Appendix C.

Figure 2



Demographics

As previously noted, melanoma of the skin tends to strike a younger population than other cancers. While the majority of most other cancers are diagnosed in persons over 65 years of age, the age-specific incidence rate for melanoma begins to increase in early adulthood and continues to rise steadily until the 70-74 year age group, at which point the rate stabilizes somewhat. Figure 3 illustrates this trend (See also Appendix Table C-4).

Figure 3

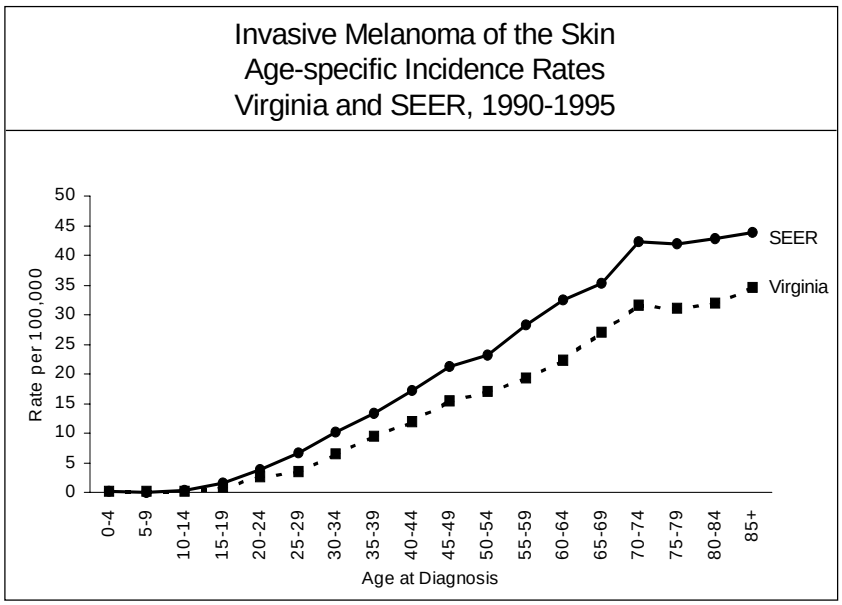


Table 1

Distribution of Melanoma of the Skin
Count and Percentage by Sex and Race,
Virginia, 1970-1996
Invasive Incidence Rate by Sex and Race,
Virginia and SEER, 1990-1995

	1970-1996		1990-1995 Rate per 100,000		
			Virginia		SEER
	Count	%	Count	Rate	Rate
SEX					
Male	4,789	*53.1*	2,073	11.0 [a]	15.2
Female	4,214	*46.7*	1,663	7.2 [a]	10.5
RACE					
White	8,096	*89.8*	3,248	9.5 [a]	14.3
Black	141	*1.6*	47	0.7	0.9
Other	70	*0.8*	38	4.4 [a]	1.0
Unknown	711	*7.9*	403	n/a	n/a
TOTAL	**9,018**	***100.0***	**3,736**	**8.9 [a]**	**12.5**

Note. Fifteen cases of unknown sex are included in Virginia total. Count and percentage data for 1970-1996 include in situ melanomas. Total figures include 16 cases of unknown race. Rates are age-adjusted to the 1970 US population and are based on invasive cases only.
[a] Significant difference from SEER rate (p<.05).

As shown in Table 1, the statewide incidence rate for males was higher than that of females, a pattern also seen in SEER comparison data. Melanoma of the skin is primarily a disease of the white population. Blacks and Asians rarely develop this cancer.[2] In Virginia, the incidence rate for whites was almost 13 times the rate for blacks. Overall, demographic patterns were similar for Virginia and the U.S.[2]

Histology

Melanoma of the skin manifests as one of four major histologic types: superficial spreading melanoma, nodular melanoma, lentigo malignant melanoma, and acral lentiginous melanoma. In Virginia, the distribution of melanoma histologies cannot be analyzed completely because reports of melanoma to the Virginia Cancer Registry included a disproportionate number of lesions classified as "Melanoma, Not Otherwise Specified (NOS)" (See Appendix Table C-5). Due to the lack of histologic classification, no definitive comparison to nationwide data can be made. Of melanomas that were definitively classified, 46% were superficial spreading melanoma, 26% lentigo maligna melanoma, 15% nodular, and 1% acral lentiginous melanoma. However, histologic type is not a critical indicator of prognosis, if differences in tumor thickness are considered.

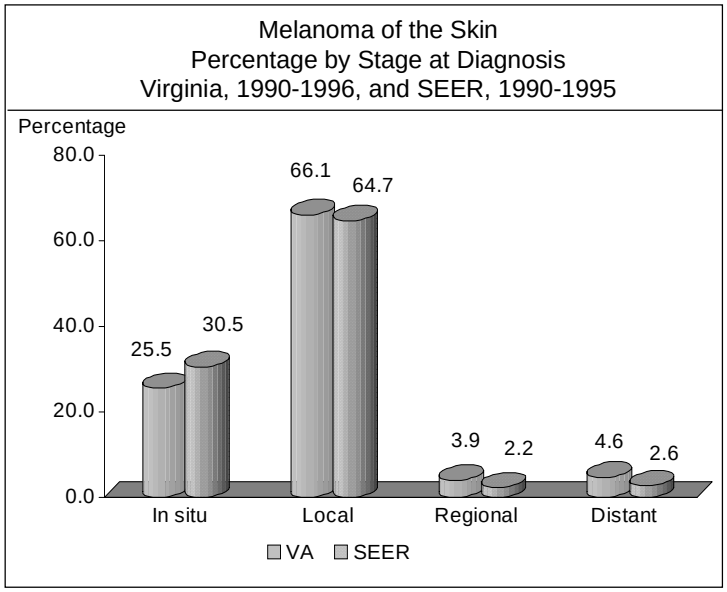
Anatomic Distribution

Demographic and temporal views of the anatomic distribution of melanoma are provided in Appendix Table C-6. Gender and age especially influence the anatomic distribution of melanoma. Generally, the most common sites for melanoma are the trunk and limbs, but the distribution varies by sex. In Virginia men, the three most frequently diagnosed sites of melanoma were the trunk (38.4%), the upper limbs and shoulders (20.1%), and the face (17.2%). Over 75% of melanoma cases diagnosed in males were found in one of these three sites. The three most common sites for women in Virginia were the lower limbs and hips (31.2%), the upper limbs and shoulders (24.7%), and the trunk (24.4%). Eight out of ten melanoma cases diagnosed in females occurred in one of these three sites. The face was the most common place melanoma occurred in persons age 70 and older, while melanoma on the trunk was more often seen in persons under the age of 70. The anatomic distribution of melanoma was not found to vary by health region in Virginia. There also did not appear to be a trend in anatomic distribution for the state between 1990 to 1996. Overall, the patterns seen in anatomic distribution in Virginia followed national trends.[2]

Clinical Evaluation and Staging

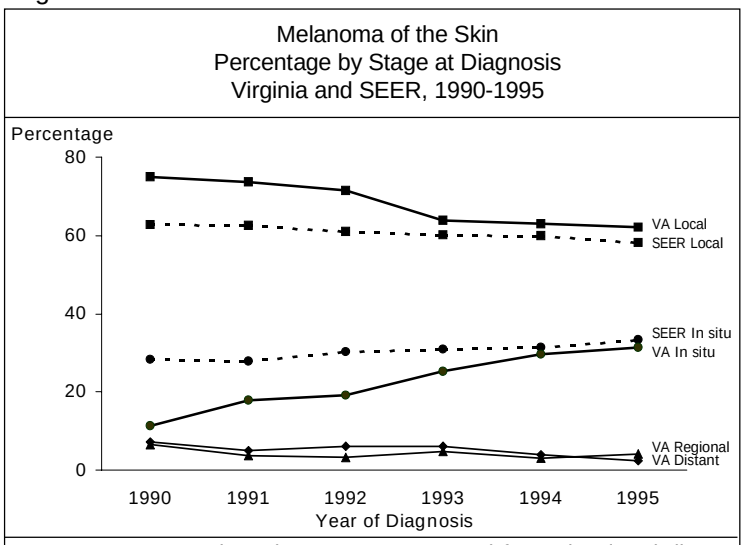
Two distinct types of staging have been reported to the VCR for melanoma cases: SEER Summary Stage (in situ, local, regional and distant) and AJCC Stage Grouping (Stages 0-IV). Appendix A contains an explanation of staging guidelines. Among melanoma cases diagnosed between 1990 and 1996, SEER Summary Stage data were reported for 80% of the cases, while AJCC stage data were noted in only 47% of the cases (See Appendix Table C-7). Where AJCC stage data were available, the quality of the reports was questionable. Breslow's Levels and Clark's Levels, while very useful when staging melanoma cases, were not available in the Virginia Cancer Registry database at the time of these analyses. Because AJCC stage data were not available for most melanoma cases reported to the VCR, and because the AJCC melanoma staging system will be revised in 1999, detailed analysis of 1990-1996 Virginia data are presented using SEER Summary Stages.

Figure 4



As Figure 4 illustrates, over 90% of Virginia melanoma cases were classified as early stage (in situ or local) when SEER staging conventions were used. This percentage was slightly lower than SEER's percentage of early stage skin melanoma (95.2%). However, as Figure 5 demonstrates, the disparity between Virginia and SEER percentages of cases diagnosed in situ and in the local stage has decreased each year since 1990 (Also See Table C-8).

Figure 5



Note. SEER comparison data are not presented for regional and distant stage melanoma because little change was observed in Virginia data from 1990 to 1995.

When stage was analyzed by demographic variables, several trends emerged. Women had a greater percentage of melanoma diagnosed in the local stage than men (74.4% vs. 69.4%, respectively), while the percentage of melanoma diagnosed in the regional and distant stages was higher for males (12.6%) than for females (8.0%). The differences in stage presentation between men and women remained constant even when the effects of age and anatomic site were controlled (data not shown here).

Melanoma in the black population tended to be detected more often in the later stages (28.5%) than melanoma in the white population (10.7%). This may be due partially to the fact that, given the infrequency of melanoma in blacks, the disease is usually not identified until more common diagnoses such as plantar warts or subungual hematomas[9] have been ruled out. A greater percentage of persons over the age of 60 were diagnosed with late stage (regional or distant) melanoma (12.0%) than were younger persons (9.4%), even when the effect of anatomic site was removed (data not shown here).

Around the state, a greater percentage of melanoma was detected while still in situ for residents in the North and Northwest regions (22.8% and 21.8%, respectively) than the rest of the state (12.6%-15.7%). The Central region had a higher percentage of regional and distant stage melanoma (14.3%) than other regions (8.2%-11.4%). Looking at melanoma by subsite, a greater percentage of facial melanoma was diagnosed in situ (32.4%) than any other site (9.6%-17.8%). Over 75% of melanoma that occurred on the trunk, upper limbs, or lower limbs was diagnosed while in the local stage. The specific anatomic site with the greatest percentage of distant stage melanoma was the scalp and neck (5.8%).

Table 2

Distribution of Melanoma of the Skin
Count and Percentage by First Course Treatment Combination,
Virginia, 1970-1996
Percentage by First Course Treatment Combination,
NCDB, 1985-1994

	Virginia 1970-1996		NCDB 1985-1994
TREATMENT COMBINATION	Count	%	%
Surgery Only	7,938	*88.0*	*91.5*
Surgery and Chemotherapy	85	*0.9*	*1.5*
Surgery and Radiation	82	*0.9*	*1.4*
Radiation Only	37	*0.4*	*0.7*
Surgery, Radiation and Chemotherapy	33	*0.4*	*0.4*
Chemotherapy Only	34	*0.4*	*0.5*
Radiation and Chemotherapy	26	*0.3*	*0.3*
Other Therapy Only	10	*0.1*	*n/a*
No reported treatment	773	*8.6*	*3.7*
All Treatments	**9,018**	***100.0***	***100.0***

Note. Data include in situ melanomas. Data include 152 cases that received hormone therapy, immunotherapy, or non-surgical therapy, not otherwise specified (NOS), in addition to the treatment combination specified. Virginia data from 1970 through 1996 were used for comparison purposes because no significant changes in treatment modalities over that time period have been noted.

Treatment

Table 2 demonstrates that nine out of ten Virginia skin melanoma cases received some form of surgery, including surgical biopsy. Less than four percent of cases received one or more other forms of therapy (chemotherapy, radiation, immunotherapy, etc.). Almost 9% of Virginia cases had no treatment reported, compared to less than 4% of NCDB cases. Because of the small percentage of melanoma cases that received forms of treatment other than surgery, detailed analysis of treatment will focus on surgery. The two most common forms of surgery reported were 1) excision of lesion or local amputation of site without lymph node dissection (34.7%) and 2) simple excision with pathological examination of the specimen (19.5%) (See Table C-9). If a patient received more than one type of surgery, only the highest ranking (most invasive) procedure was reported here.

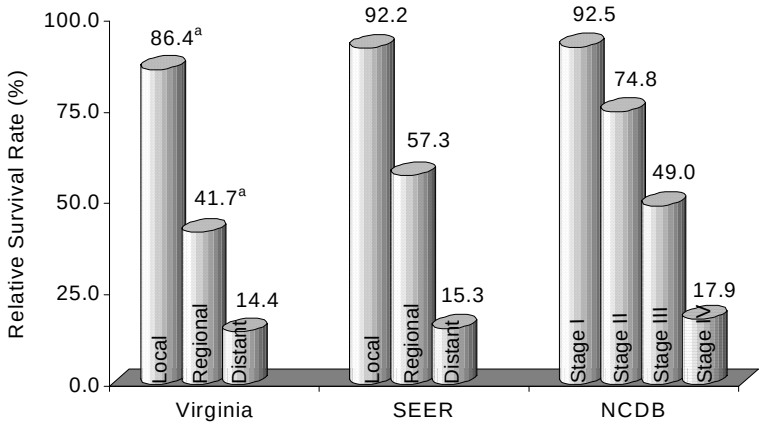
Surgery becomes more invasive as stage of disease progresses. Of Virginia melanoma cases diagnosed in the early stages, 74% were treated by biopsy or excision without any lymph node assessment. Sixty-one percent of Virginia regional stage melanoma cases were treated with surgery involving removal of nodes. One-third of Virginia distant stage melanoma cases required surgery involving lymph nodes, while 45% were treated with biopsy or excision without lymph node removal. While non-surgical treatments were rarely used to treat early stage melanomas, 15% of cases with regional stage disease and 49% of cases with distant stage melanoma received some form of immunotherapy, chemotherapy, or radiation (See Table C-10).

Survival

In Virginia, the relative five-year survival rate for all stages combined was 78.9% for all cases diagnosed between 1970 and 1989, significantly lower than the overall five-year survival rate reported by SEER (86.7%), but not significantly lower than the NCDB rate (80.8%). As shown in Figure 6, Virginia's relative five-year survival rate ranged from 86.4% for localized cancers to 14.4% for cancers with distant metastasis. Although Virginia survival rates were lower than those reported by the SEER program, survival patterns for different subpopulations followed national norms (See Appendix Table C-11). Females had a higher survival rate than males (84.2% vs. 73.6%). Over 82% of Virginians diagnosed with melanoma on the limbs and facial sites survived five-years post-diagnosis, while fewer of those diagnosed with melanoma on the trunk, scalp and neck survived as long. Among Virginia health regions, the Northern and Northwestern regions had five-year survival rates above 80%, while other regions had five-year survival rates below 80%.

Figure 6

Malignant Melanoma of the Skin
Relative Five-year Survival Rates by Stage at Diagnosis
Virginia, 1970-1989, SEER, 1973-1989, and NCDB, 1985-1989

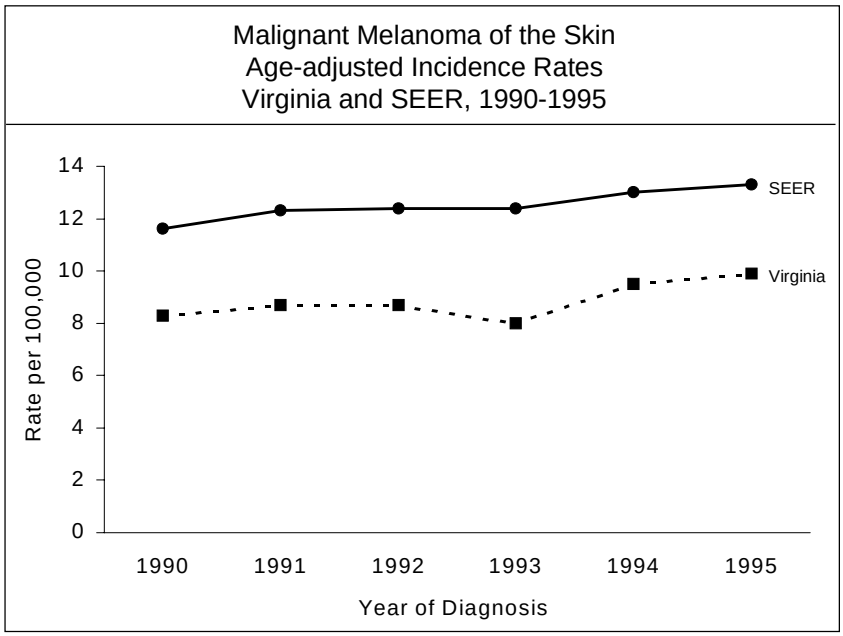


[a] Significant difference from SEER rate (p<.05).

An average of 164 Virginia residents died from melanoma each year from 1990 to 1996. These deaths from melanoma represented 1.3% of all cancer-related deaths in Virginia, the same as the national average. The average annual mortality rate due to melanoma was 2.3 deaths per 100,000 persons, based on data from 1990 to 1996.[11]

Discussion

Figure 7



Melanoma is known to be an underreported cancer nationwide.[12] As shown in Figure 7, Virginia rates have been consistently lower than SEER rates during the 1990s. Disparity in these rates may be partially explained by the assumption that Virginia has a more severe problem with underreporting of all cancers than has been found nationally. To address this problem, Virginia amended the existing cancer reporting law in July of 1998 to include physician office cases not otherwise reported.[3] This amended law requires physicians who treat cancer patients in an office setting to report all new cancer cases to the Virginia Cancer Registry if a hospital or in-state laboratory has not reported the case. Because a substantial amount of melanoma treatment is performed in outpatient settings,[12] this new law may help capture melanoma cases that would previously have gone unreported. This site study will serve as a benchmark to measure the effect of these new physician reporting laws on the reporting of melanoma.

Incidence in Virginia tended to follow patterns seen throughout the nation. Whites were diagnosed at a rate 15 times higher than that of blacks. Melanoma was diagnosed in younger adults as frequently as it was detected in older persons. Men tended to have higher incidence rates than women. Statewide, the three most common sites for melanoma were the trunk, upper limbs and shoulders, and the lower limbs and hips; however, the distribution was greatly influenced by sex and age.

Although over 90% of melanoma was detected in the early stages, Virginia still lags behind the SEER average. Promisingly, the percentage of early stage melanoma has been increasing each year in the state. However, efforts toward risk reduction and early detection must be continued and enhanced. Males, persons ages 60 and over, and blacks are at highest risk for being diagnosed with late stage melanoma. These populations could potentially benefit the most from prevention initiatives.

More complete and precise collection of pathology-related data needs to be a priority for hospital registries as well as central registries. Pathology reports of biopsies should include the thickness, radius, and histological subtype of melanoma.

Information about tumor satellites, level of invasion, and rate of mitotic activity should also be included.[13] Although 98% of melanoma cases reported to the VCR were confirmed by a pathologist, information about histologic subtype and lesion thickness, radius, and depth of invasion were incomplete for the majority of cases. Analyses of treatment and survival based on such pathological information could prove to have meaningful implications for clinicians and patients.

The data on Virginia melanoma show that therapy administered conformed with standard treatment guidelines[14] and national comparison data.[10] The most common form of treatment in Virginia was surgery. Almost ninety percent of skin melanoma cases received some form of surgery, including surgical biopsy. For patients with in situ melanoma, the common surgical procedures involved simple excisions of the lesion. For later stage disease, surgery often involved lymph nodes or distant sites. It is interesting to note that the percentage of distant stage cases having biopsy as their only surgical procedure was higher than local or regional stage. These distant stage patients were more likely to require other forms of treatment, such as chemotherapy or immunotherapy, than were persons diagnosed with local or regional stage melanoma. These non-surgical treatments can be combined with other modalities depending on the site and stage of disease.

Statewide, five-year survival rates for melanoma were lower than the national average. Survival rates tend to decrease as melanoma becomes more invasive. Therefore, the survival pattern observed here may be partially explained by the finding that the percentage of Virginia melanoma cases diagnosed in situ was smaller than SEER percentages. Survival rates by subsite and sex followed previously reported findings,[15] with lower survival rates for males and poorer prognosis for trunk, scalp and neck lesions. Around Virginia, the residents of the Northern and Northwestern health regions had the highest survival rates. The Northern and Northwestern regions also had the highest percentage of melanoma diagnosed in situ and the lowest percentage of late stage melanoma. Although other factors can contribute to better survival rates, the impact of early diagnosis must be acknowledged.

Recommendations for Prevention

Efforts to control melanoma can focus on primary prevention (risk reduction) and secondary prevention (early detection). Avoiding sun exposure, especially during midday and during the first decade of life, can diminish the risk of developing melanoma.[16] When exposure to ultraviolet radiation (UVR) cannot be avoided, the use of sunscreen and protective clothing and hats is strongly recommended.[17,18] Healthy People 2000 objectives call for at least 60% of Americans to limit natural and artificial sources of UVR and use sunscreens and protective clothing when exposure is unavoidable. In 1992, only 28% of those surveyed by the National Health Interview Survey used sunscreens or wore protective clothing, while 31% of respondents said they limited sun exposure.[19]

Because melanoma is highly curable when diagnosed early, screening programs are an effective way to reduce the personal and economic burdens of disease, particularly among those at high risk.[20] Self-surveillance for melanoma should follow the ABCD rule: Asymmetry, Border irregularity, Color variation, Diameter greater than 6mm. Any mole or skin lesion that meets one or more of these criteria should be examined by a health care professional. Also, any mole or lesion that has changed shape, size, color or surface, or that has become raised, ulcerated, or bloody should be evaluated for possible melanoma.[21]

Public education campaigns should include several components. Awareness of risk factors, both personal and environmental, should be raised. Methods of reducing personal risk and proper self-examination for suspicious lesions should also be emphasized. The public needs to be aware of the benefits of early detection and prompt treatment, including the chances for decreased mortality.[22]

Education of health care providers should not be overlooked. In a study by Cassileth and colleagues,[23] accurate recognition of melanoma by non-dermatologists is low. Professional education efforts should increase knowledge of early warning signs and symptoms and facilitate more reliable diagnoses by primary care providers and non-dermatology specialists. Learning to identify high-risk patients and methods of educating those patients would also be beneficial to health care practitioners.

Allied health workers, such as physical therapists and nursing home aides, routinely view large areas of a patient's skin surface. These professionals would be able to bring a suspicious mole to the attention of an attending physician or nurse. Education of allied health workers could facilitate early detection. One anatomic site where melanoma tends to be detected in the later stages is the scalp and neck. Hairstylists and barbers are in the best position to notice abnormal skin lesions in this area and recommend medical attention to their clients. Perhaps a seminar taught by a dermatologist on recognizing suspicious skin lesions should be explored as a requirement for licensure in cosmetology.

As survival data on melanoma presented in this report have shown, a Virginia resident diagnosed with the disease stands a higher chance of dying than does the average American. Virginia populations that need particular attention include males, persons ages 60 and older, and members of the black population. Prevention programs must educate the public as well as professionals groups about the importance of risk reduction and early detection.

Recommendations for Future Research

New developments in melanoma management over the past few years include (a) increased screening due to heightened public awareness, (b) sentinel node biopsy for staging, (c) the introduction of interferon-alfa for adjuvant therapy of high risk melanoma, (d) approval of interleukin-2 therapy of stage IV melanoma, and (e) the introduction of new immunotherapy approaches using tumor vaccines.

The expected outcome from increased screening is an increased number of melanoma diagnoses, and that has been observed. Because of an increase in cancer reporting in Virginia since 1970, direct measures of increased diagnosis do not necessarily reflect true changes in incidence. However, the more critical measures of stage at diagnosis and survival rate would be expected to improve when there is increased screening leading to earlier diagnosis. Data in the present report do suggest that a larger percentage of cases are diagnosed in the early stage, but the absence of data on depth of invasion (Clark's Level) and Breslow thickness prevent a more detailed characterization of the proportion of patients diagnosed with thin, low risk lesions. To address this problem, the VCR has made changes to its database that will allow for the collection of information on these two important staging criteria. It would be expected that the percentage of patients with in situ melanoma and melanoma <1.5mm thick will be greater over time, and that the overall survival rate will improve for stage I melanomas.

Sentinel node biopsy has become a part of the standard management of patients with intermediate and thick melanoma, as it permits accurate staging with minimal morbidity.[24-27] The result likely will be that a greater percentage of patients are staged at their regional nodes, and this usually results in better survival rates by stage, since it converts patients with clinically negative nodes to stage III and likewise results in incorporation into the group of stage III patients an increased number with minimal tumor volumes. The result should be improved survival across stages II and III in particular. Thus, it is recommended that the frequency of sentinel node biopsy be recorded for the original staging, and that this be tracked prospectively in conjunction with survival data. Improvements in stage-specific survival without changes in survival by primary tumor thickness alone, would be expected if sentinel node biopsies are performed in a large number of cases.

Because interferon-alfa (IFN) is now approved for use, it has changed the way melanoma is managed.[28] On one hand, it offers a chance for improved survival for patient with node-positive disease (and possibly for patients with thick primary melanomas). On the other hand, it is frequently a very toxic therapy; so in our experience a minority of patients choose it, despite its demonstrated effects. The VCR should endeavor to record use of IFN, especially in the first course of therapy so that subsequent reviews of survival data can assess its impact.

Similarly, interleukin-2 (IL-2) has been approved for use in patients with unresectable Stage IV melanoma, and reports suggest that a subset of 5-8% of patients may experience long-term complete responses.[29] A population-based assessment of IL-2's effects would be of particular interest; so we specifically suggest collection of data on IL-2 use in stage IV melanoma, with or without cytotoxic chemotherapy.

On the horizon are experimental therapies, many of which involve tumor vaccines.[30] Reports published in 1998 suggest that response to the current generation of these approaches may be comparable to results with cytotoxic chemotherapy;[31,32] so they may soon take their place in the armamentarium against melanoma. These therapeutic

approaches include peptide-based vaccines, whole-cell vaccines, vaccines using dendritic cells to present antigen. They are being administered with or without cytokines and may involve gene therapy approaches. Other immunotherapeutic approaches have included adoptive therapy with cytotoxic T-lymphocytes.[33] The Registry can participate in this exciting area of clinical research by tracking the types of therapy employed.

Finally, it should be noted that there are ongoing discussions about changing the AJCC staging system for melanoma again.[34,35] It is strongly recommended that the elements of the proposed new staging system be collected for the VCR so that this population-based registry continues to be useful for future studies of prognosis and outcome.

Appendix A: Technical Notes

Case ascertainment

These data reflect a conservative account of cancer in Virginia. Residents sometimes travel out-of-state for diagnosis and treatment. While the Registry now maintains data exchange agreements with central registries in five of the six neighboring states (including the District of Columbia) in order to minimize the loss of reporting, not all states were collecting cancer reports during the early 1990s. Also, not all Virginia hospitals, outpatient facilities, and private pathology laboratories were reporting cases to the Registry during the 1990-1996 period. Further, some patients may have been missed by the routine casefinding methods used in reporting facilities. These factors combined lead to biases in the cases that are reported. Underreporting of cancer occurs to varying degrees in different areas of the state; for example, counts may be more accurate in urbanized areas simply because the case ascertainment is more complete. Similarly, case reporting may be more complete for certain racial groups, cancer sites, or diagnosis stages. Note that age-adjusted rates for the Southwest region especially are consistently low. This will be remedied when the Virginia Cancer Registry begins exchanging cases with the central registry of the neighboring state in that region.

Population

Population data used to calculate age-specific and age-adjusted incidence rates were derived from two sources. Estimates for 1990 are the Modified Age-Race-Sex (MARS) population figures from the U.S. Bureau of the Census. Estimates for 1991, 1992, 1993, and 1994 were linearly imputed from the age-race-sex specific figures from the 1990 MARS data and from the 1995 population projections published by the Virginia Employment Commission's State Data Center. In order to calculate average annual incidence rates for 1990-1995, estimates for each of the six years were then summed for a total population-at-risk figure.

Incidence Rates

A cancer incidence rate reflects the number of new cases diagnosed per 100,000 individuals in a given population over a defined time period. Cancer rates tend to vary substantially by age, with higher rates of most cancers noted in older populations. This report provides both age-specific and age-adjusted incidence rates. Age-specific rates denote the incidence of cancer among persons within specific age categories (typically 0-4 years, 5-9 years, 10-14 years, etc., up to 85+ years). Age-adjusted rates are calculated by mapping age-specific rates onto a standard population to remove the effect of different age structures and to arrive at a single summary measure for comparison. The age-adjusted incidence rates were calculated by the direct method, using the age distribution of the 1970 United States population as the standard. Rates were calculated by sex, race, and region. Except where noted, all incidence rates are expressed per 100,000 persons per year and exclude in situ carcinomas. Some age-adjusted incidence rates in this report are average rates calculated by dividing the total cases during 1990-1995 by the sum of the annual population data for those years.

Mortality Rates

Age-adjusted mortality rates were obtained from the Virginia Center for Health Statistics. The cancer mortality rate reflects the number of deaths due to cancer per 100,000 individuals in a given area over a defined time period. Cancer death rates tend to vary substantially by age, with higher rates noted in older populations. This report provides the age-adjusted mortality rate for Virginia as a whole. The age-adjusted mortality rate was calculated by the direct method, using the age distribution of the 1970 United States population as the standard. The mortality rate is expressed per 100,000 persons.

Relative Survival Rate

The relative survival rate is defined as the ratio of the observed survival rate of melanoma cases to the expected survival rate of a similar population over a defined period of time. The relative survival rate corrects for death from other outcomes and allows for comparison to a similar group of persons without cancer. As the relative survival rate approaches 100 percent, the survival experience of the study population more closely resembles the survival experience in the general population. Relative survival rates were calculated using Rocky Mountain Cancer Data Systems based on 1990 U.S. Life Tables from the National Center for Health Statistics by age and sex. Relative survival rates in this report are five-year survival rates.

Race Grouping

According to the modified 1990 U.S. Census data of February 1992, 78.3% of Virginia's population was white, 18.9% black, and 2.8% was of an other race, including Asian / Pacific Islander and Native American. Race-specific counts and rates could only be calculated for white, black, and other races, since reliable population estimates are not available for more specific racial populations.

Staging

The progression of malignant melanoma is classified by categories or stages. Identifying the stage of melanoma is useful in evaluating the scope of disease and choosing treatment. There are several methods of classifying stage; most of them are based on thickness, level of invasion and spread to adjacent structures and organs. Two classification schemes used most often by pathologists are Breslow's Classification[15] and Clark's Classification.[30] Breslow's Classification assesses thickness of the lesion, and for staging purposes, categorizes it within the following four ranges:

1) less than or equal to 0.75mm,
2) between 0.76mm and 1.50mm,
3) between 1.51mm and 4.0mm
4) greater than 4.0mm.

Clark's Classification assesses a lesion's level of invasion of the successive surrounding tissues. Lesions involving only the epidermis, the top layer of skin, fall into Clark's Level I. This is also described as "melanoma in situ." Clark's Level II includes lesions that invade the papillary dermis, but do not reach the papillary-reticular interface. If a lesion fills and expands the papillary dermis, but does not penetrate the reticular dermis, it is considered a Clark's Level III. A lesion that invades through the reticular dermis, but not into the subcutaneous tissue is classified as a Clark's Level IV. Any lesion that invades through the reticular dermis into the subcutaneous tissue is a Clark's Level V.

Two summary staging systems are in use. The system advocated by the American College of Surgeons is American Joint Committee on Cancer (AJCC) Tumor, Node and Metastasis (TNM) classification and stage grouping. AJCC stage refers to the system advocated by the American College of Surgeons' (AJCC) Tumor, Node and Metastasis (TNM) classification and stage grouping. This system incorporates "the identification of new prognostic factors which may influence choice of treatment."[36] To reflect advances in the understanding of cancer, the AJCC system has undergone several revisions since its inception in 1978. In fact, the AJCC staging system for melanoma will be undergoing another revision in 1999. The system developed by the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program has not undergone any revisions since its inception in 1977. This system focuses more on the extent of disease and is more general in its categorization of stage. Because the stage categories have not changed since 1977, SEER staging is more appropriate to use when assessing stage trends over time. The two systems are outlined in the following tables.

AJCC Stage Grouping Classification[37]

Stage 0	Melanoma in situ, not an invasive lesion (Clark's Level I)
Stage I	Tumor thickness not more than 1.5mm (up to Breslow's Level II) and/or invades to papillary-reticular dermal interface (up to Clark's Level III)
Stage II	Tumor thickness between 1.5mm and 4.0mm (Breslow's Level III) and/or invades the reticular dermis (Clark's level IV)
Stage III	Tumor thickness more than 4.0mm (Breslow's Level IV) and/or invades the subcutaneous tissue (Clark's Level V) and/or presence of statellite(s) within 2cm of primary tumor OR Any tumor thickness/Breslow's Level or Clark's Level with regional lymph node involvement
Stage IV	Any tumor thickness/Breslow's Level or Clark's Level with regional lymph node involvement and distant metastasis

SEER Summary Staging Classification[38]

In situ	Melanoma in situ, not an invasive lesion (Clark's Level I)
Local	Any tumor thickness and/or up to invasion of subcutaneous tissue (Clark's Level II-V)
Regional	Presence of satellite(s) and/or regional lymph node involvement
Distant	Distant metastasis

Appendix B: Health Regions

Virginia is made up of 95 counties and 40 independent cities, which are grouped into 35 Health Districts, or five Health Regions. The composition of the Health Regions and Health Districts is listed in the table below.

Health Region	Health District	Locality
NORTHWEST	Central Shenandoah	Counties of Augusta, Bath, Highland, Rockbridge, Rockingham; Cities of Buena Vista, Harrisonburg, Lexington, Staunton, Waynesboro
	Lord Fairfax	Counties of Clarke, Frederick, Page, Shenandoah, Warren; City of Winchester
	Rappahannock	Counties of Caroline, King George, Spotsylvania, Stafford; City of Fredericksburg
	Rappahannock / Rapidan	Counties of Culpepper, Fauqier, Madison, Orange, Rappahannock
	Thomas Jefferson	Counties of Albemarle, Fluvanna, Louisa, Nelson; City of Charlottesville
NORTH	Alexandria	City of Alexandria
	Arlington	County of Arlington
	Fairfax	County of Fairfax; Cities of Fairfax, Falls Church
	Loudoun	County of Loudoun
	Prince William	County of Prince William; Cities of Manassas,* Manassas Park*
SOUTHWEST	Alleghany	Counties of Alleghany, Botetourt, Craig, Roanoke; Cities of Clifton Forge, Covington, Salem
	Central Virginia	Counties of Amherst, Appomattox, Bedford, Campbell; Cities of Bedford, Lynchburg
	Cumberland Plateau	Counties of Buchanan, Dickenson, Russell, Tazewell
	Lenowisco	Counties of Lee, Scott, Wise; City of Norton
	Mount Rogers	Counties of Bland, Carroll, Grayson, Smyth, Washington, Wythe; Cities of Bristol, Galax
	New River	Counties of Floyd, Giles, Montgomery, Pulaski; City of Radford
	Pittsylvania / Danville	County of Pittsylvania; City of Danville
	Roanoke	City of Roanoke
	West Piedmont	Counties of Franklin, Henry, Patrick; City of Martinsville
CENTRAL	Chesterfield	Counties of Chesterfield, Powhatan; City of Colonial Heights
	Crater	Counties of Dinwiddie, Greensville, Prince George, Surry, Sussex; Cities of Emporia, Hopewell, Petersburg
	Hanover	Counties of Charles City, Goochland, Hanover, New Kent
	Henrico	County of Henrico
	Piedmont	Counties of Amelia, Buckingham, Charlotte, Cumberland, Lunenburg, Nottoway, Prince Edward
	Richmond	City of Richmond
	Southside	Counties of Brunswick, Halifax, Mecklenberg; City of South Boston
EAST	Chesapeake	City of Chesapeake
	Eastern Shore	Counties of Accomack, Northampton
	Hampton	City of Hampton
	Norfolk	City of Norfolk
	Peninsula	Counties of James City, York; Cities of Newport News, Poquoson, Williamsburg
	Portsmouth	City of Portsmouth
	Three Rivers	Counties of Essex, Gloucester, King and Queen, King William, Lancaster, Mathews, Middlesex, Northumberland, Richmond, Westmoreland
	Virginia Beach	City of Virginia Beach
	Western Tidewater	Counties of Isle of Wight, Southampton; Cities of Franklin, Suffolk

*The cities of Manassas and Manassas Park are analyzed together with Prince William County.

Appendix C: Data Tables

Table C-1
Distribution of Melanoma of the Skin, Virginia, 1990-1996
Count and Percentage of Total Cancer by Year of Diagnosis

YEAR	Count	*%*
1990	596	*2.7*
1991	712	*3.0*
1992	720	*2.9*
1993	715	*2.8*
1994	911	*3.5*
1995	975	*3.7*
1996	983	*3.9*
1990-1996	**5,612**	***3.2***

Note. Data include in situ melanomas.

Table C-2
Distribution of Invasive Melanoma of the Skin, Virginia, 1990-1995
Comparison of Regional Incidence Rates to Virginia and SEER

	1990-1995		1990	1991	1992	1993	1994	1995
	Rate	Count	Rate	Rate	Rate	Rate	Rate	Rate
Northwest	10.6 [a,b]	624	8.2 [a]	10.0	12.2 [b]	9.2 [a]	12.3	11.2
North	9.9 [a,b]	902	8.3 [a]	9.3 [a]	8.0 [a]	10.0 [a]	11.3	11.9
Southwest	8.2 [a]	770	7.8 [a]	8.0 [a]	8.6 [a]	6.9 [a]	9.4 [a]	8.6 [a,b]
Central	7.5 [a,b]	563	7.4 [a]	7.0 [a]	7.4 [a]	7.8 [a]	7.3 [a]	8.2 [a]
East	8.7 [a]	870	9.5 [a]	9.5 [a]	8.4 [a]	7.3 [a]	8.0 [a]	9.7 [a]
Virginia	8.9 [a]	3,736	8.3 [a]	8.7 [a]	8.7 [a]	8.0 [a]	9.5 [a]	9.9 [a]
SEER	12.5	20,357	11.6	12.3	12.4	12.4	13.0	13.3

Note. Rates are age-adjusted to the 1970 US population, are per 100,000 persons, and are based on invasive cases only.
[a] Significant difference from SEER rate ($p<.05$).
[b] Significant difference from Virginia rate ($p<.05$).

Table C-3
Distribution of Melanoma of the Skin
Count by Health Region and Health District, Virginia, 1970-1996
Invasive Incidence Rate by Health Region and Health District, Virginia, and SEER, 1990-1995

		1970-1996	1990-1995 Rate per 100,000	
HEALTH REGION	HEALTH DISTRICT	Count	Count	Rate
Northwest		**1,731**	**624**	**10.6** [a,b]
	Central Shenandoah	595	191	11.7 [b]
	Lord Fairfax	253	102	8.3 [a]
	Rappahanock	353	139	16.0 [a,b]
	Rappahanock/Rapidan	166	69	6.8 [a,b]
	Thomas Jefferson	364	123	10.9
North		**2,126**	**902**	**9.9** [a,b]
	Alexandria	205	88	11.6
	Arlington	200	79	6.5 [a,b]
	Fairfax	1,290	536	10.1 [a,b]
	Loudoun	142	65	11.4
	Prince William	289	134	10.1 [a]
Southwest		**1,814**	**770**	**8.2** [a]
	Alleghany	210	80	6.6 [a,b]
	Central Virginia	443	166	10.5 [a]
	Cumberland Plateau	70	28	3.4 [a,b]
	Lenowisco	41	18	2.6 [a,b]
	Mount Rogers	181	103	7.2 [a,b]
	New River	200	121	12.5 [b]
	Pittsylvania/Danville	223	66	7.8 [a]
	Roanoke City	234	111	14.9 [b]
	West Piedmont	212	77	7.8 [a]
Central		**1,224**	**563**	**7.5** [a,b]
	Chesterfield	267	140	8.9 [a]
	Crater	132	57	5.9 [a,b]
	Hanover	123	70	10.5
	Henrico	267	146	9.2 [a]
	Piedmont	100	45	6.6 [a,b]
	Richmond City	271	73	5.3 [a,b]
	Southside	64	32	4.7 [a,b]
East		**2,101**	**870**	**8.7** [a]
	Chesapeake	241	95	10.1 [a]
	Eastern Shore	44	24	7.0 [a]
	Hampton	119	57	6.7 [a,b]
	Norfolk	335	96	6.8 [a,b]
	Peninsula	336	154	9.1 [a]
	Portsmouth	144	57	7.6 [a]
	Three Rivers	149	58	5.8 [a,b]
	Virginia Beach	616	276	13.5 [b]
	Western Tidewater	117	53	7.3 [a]
Virginia		**9,018**	**3,736**	**8.9** [a]
SEER			**20,357**	**12.5**

Note. Count and percentage data for 1970-1996 include in situ melanomas. Total figures include 22 cases of unknown Virginia residence. All rates are age-adjusted to the 1970 US population and are based on invasive cases only.

[a] Significant difference from SEER rate ($p<.05$).

[b] Significant difference from Virginia rate ($p<.05$).

Table C-4
Distribution of Melanoma of the Skin
Count and Percentage by Age at Diagnosis, Virginia, 1970-1996
Age-Specific Invasive Incidence Rate by Age at Diagnosis, Virginia and SEER, 1990-1995

	1970-1996		1990-1995 Invasive Rate per 100,000	
AGE	Count	%	VA	SEER
0 to 4	4	*0.0*	0.1	0.1
5 to 9	5	*0.1*	0.1	0.0
10 to 14	9	*0.1*	0.2	0.3
15 to 19	58	*0.6*	0.8	1.6
20 to 24	195	*2.2*	2.6	3.9
25 to 29	367	*4.1*	3.5	6.7
30 to 34	616	*6.8*	6.5	10.2
35 to 39	792	*8.8*	9.5	13.4
40 to 44	853	*9.5*	12.0	17.2
45 to 49	870	*9.6*	15.4	21.2
50 to 54	837	*9.3*	17.0	23.1
55 to 59	815	*9.0*	19.3	28.3
60 to 64	803	*8.9*	22.3	32.4
65 to 69	894	*9.9*	27.5	35.2
70 to 74	755	*8.4*	31.5	42.2
75 to 79	539	*6.0*	31.1	42.0
80 to 84	333	*3.7*	32.0	42.8
85 and older	269	*3.0*	34.5	43.8
All Ages	**9,018**	***100.0***		

Note. Four cases of unknown age are included in total figures. Count and percentage data for 1970-1996 include in situ melanomas. Rates are average annual age-specific incidence rates and are based on invasive cases only.

Table C-5
Distribution of Melanoma of the Skin, Virginia, 1970-1996
Count and Percentage by Histologic Type

HISTOLOGIC TYPE	Count	%
Melanoma, NOS	5,599	*62.1*
Superficial spreading	1,560	*17.3*
Hutchinson's melanotic freckle	892	*9.9*
Nodular	524	*5.8*
Acral lentiginous	33	*0.4*
Other	410	*4.5*
All Types	**9,018**	***100.0***

Note. Data include in situ melanomas. Hutchinson's melanotic freckle is also known as lentigo maligna melanoma.

Table C-6
Anatomic Distribution of Melanoma of the Skin, Virginia, 1970-1996
Count and Percentage by Selected Demographics, Health Region, and Year of Diagnosis

	Trunk		Upper Limb & Shoulder		Lower Limb & Hip		All Facial Sites		Scalp & Neck		Other Skin Subsites	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
SEX												
Male	1,841	*38.4*	962	*20.1*	454	*9.5*	822	*17.2*	412	*8.6*	298	*6.2*
Female	1,029	*24.4*	1,040	*24.7*	1,316	*31.2*	493	*11.7*	150	*3.6*	186	*4.4*
AGE												
0 to 9	1	*11.1*	1	*11.1*	2	*22.2*	1	*11.1*	3	*33.3*	1	*11.1*
10 to 19	22	*32.8*	9	*13.4*	20	*29.9*	9	*13.4*	1	*1.5*	6	*9.0*
20 to 29	209	*37.2*	114	*20.3*	145	*25.8*	33	*5.9*	30	*5.3*	31	*5.5*
30 to 39	519	*36.9*	318	*22.6*	336	*23.9*	81	*5.8*	71	*5.0*	83	*5.9*
40 to 49	668	*38.8*	406	*23.6*	338	*19.6*	137	*8.0*	101	*5.9*	73	*4.2*
50 to 59	592	*35.8*	379	*22.9*	329	*19.9*	174	*10.5*	82	*5.0*	96	*5.8*
60 to 69	500	*29.5*	397	*23.4*	292	*17.2*	306	*18.0*	118	*7.0*	84	*4.9*
70 to 79	285	*22.0*	284	*21.9*	203	*15.7*	349	*27.0*	101	*7.8*	72	*5.6*
80 and older	81	*13.5*	98	*16.3*	104	*17.3*	226	*37.5*	54	*9.0*	39	*6.5*
REGION												
Northwest	533	*30.8*	373	*21.5*	334	*19.3*	300	*17.3*	103	*6.0*	88	*5.1*
North	723	*34.0*	512	*24.1*	417	*19.6*	253	*11.9*	127	*6.0*	94	*4.4*
Southwest	556	*30.7*	371	*20.5*	361	*19.9*	294	*16.2*	132	*7.3*	100	*5.5*
Central	385	*31.5*	264	*21.6*	242	*19.8*	167	*13.6*	88	*7.2*	78	*6.4*
East	672	*32.0*	482	*22.9*	412	*19.6*	300	*14.3*	110	*5.2*	125	*6.0*
YEAR OF DIAGNOSIS												
1970-1974	56	*26.0*	52	*24.2*	42	*19.5*	32	*14.9*	16	*7.4*	17	*7.9*
1975-1979	123	*27.9*	108	*24.5*	118	*26.8*	48	*10.9*	23	*5.2*	21	*4.8*
1980-1984	386	*31.8*	247	*20.4*	283	*23.3*	162	*13.4*	54	*4.5*	80	*6.6*
1985-1989	522	*33.9*	334	*21.7*	314	*20.4*	201	*13.1*	101	*6.6*	66	*4.3*
1990	198	*33.2*	121	*20.3*	103	*17.3*	94	*15.8*	37	*6.2*	43	*7.2*
1991	222	*31.2*	158	*22.2*	148	*20.8*	100	*14.0*	46	*6.5*	38	*5.3*
1992	245	*34.0*	160	*22.2*	128	*17.8*	94	*13.1*	50	*6.9*	43	*6.0*
1993	225	*31.5*	175	*24.5*	122	*17.1*	104	*14.5*	46	*6.4*	43	*6.0*
1994	296	*32.5*	186	*20.4*	167	*18.3*	145	*15.9*	68	*7.5*	49	*5.4*
1995	316	*32.4*	217	*22.3*	161	*16.5*	159	*16.3*	74	*7.6*	48	*4.9*
1996	288	*29.3*	248	*25.2*	184	*18.7*	178	*18.1*	48	*4.9*	37	*3.8*
VIRGINIA	**2,877**	***31.9***	**2,006**	***22.2***	**1,770**	***19.6***	**1,317**	***14.2***	**563**	***6.2***	**485**	***5.4***

Note. Other skin subsites include melanomas classified as overlapping lesions or skin, NOS. Data include in situ melanomas. Total figures include 15 cases of unknown sex, 4 cases of unknown age, and 22 cases of unknown region. Row percentages reflect the percentage of melanoma arising in each subsite. Percentages may not sum to 100 due to rounding. Subsite distribution for each region is similar to that for Virginia as a whole.

Table C-7
Distribution of Melanoma of the Skin, Virginia
Count and Percentage by Stage at Diagnosis
SEER and AJCC Staging Conventions

	Virginia 1990-1996		SEER 1990-1995
SEER Summary Stage	Count	%	%
In Situ	1,147	*25.5*	*30.5*
Local	2,971	*66.1*	*64.7*
Regional	175	*3.9*	*2.2*
Distant	205	*4.6*	*2.6*
TOTAL	**4,498**	***100.0***	***100.0***

Note. Virginia data exclude 1,115 cases (19.9% of all melanoma) that are unstaged or missing stage data. In reported SEER data, 4.7% of all melanoma cases are unstaged.

	Virginia 1990-1996		NCDB 1990-1994
AJCC Stage Grouping	Count	%	%
Stage 0	466	*17.6*	*16.4*
Stage I	1,250	*47.1*	*46.3*
Stage II	594	*22.4*	*23.1*
Stage III	210	*7.9*	*8.9*
Stage IV	133	*5.0*	*5.3*
TOTAL	**2,653**	***100.0***	***100.0***

Note. Virginia data exclude 2,959 cases (52.7% of all melanoma) that are unstaged or missing stage data. In reported NCDB data, 17.6% of all melanoma cases are unstaged or missing stage data.

Table C-8
Stage Distribution of Melanoma of the Skin, Virginia, 1970-1996
Count and Percentage by Year of Diagnosis, Selected Demographics,
Health Region, and Anatomic Subsite

	In situ		Local		Regional		Distant		Total Staged
	Count	%	Count	%	Count	%	Count	%	Count
YEAR OF DIAGNOSIS									
1970-1974	30	*14.0*	117	*54.7*	30	*14.0*	37	*17.3*	214
1975-1979	20	*4.6*	349	*80.6*	34	*7.9*	30	*6.9*	433
1980-1984	62	*5.2*	972	*81.3*	71	*5.9*	90	*7.5*	1,195
1985-1989	144	*9.5*	1,224	*81.0*	70	*4.6*	73	*4.8*	1,511
1990	40	*11.3*	265	*74.9*	23	*6.5*	26	*7.3*	354
1991	117	*17.8*	484	*73.6*	24	*3.6*	33	*5.0*	658
1992	122	*19.1*	458	*71.6*	21	*3.3*	39	*6.1*	640
1993	145	*25.2*	367	*63.8*	28	*4.9*	35	*6.1*	575
1994	221	*29.7*	469	*63.1*	23	*3.1*	30	*4.0*	743
1995	240	*31.4*	475	*62.1*	31	*4.1*	19	*2.5*	765
1996	262	*34.3*	453	*59.3*	26	*3.4*	23	*3.0*	764
SEX									
Male	748	*18.1*	2,868	*69.4*	252	*6.1*	267	*6.5*	4,135
Female	651	*17.6*	2,760	*74.4*	129	*3.5*	168	*4.5*	3,708
RACE									
White	1,147	*15.9*	5,319	*73.5*	360	*5.0*	410	*5.7*	7,236
Black	15	*11.5*	78	*60.0*	14	*10.8*	23	*17.7*	130
Other	14	*31.8*	25	*56.8*	3	*6.8*	2	*4.5*	44
Unknown	227	*51.4*	211	*47.7*	4	*0.9*	0	--	442
AGE									
0 to 9	0	--	8	*88.9*	1	*11.1*	0	--	9
10 to 19	8	*13.8*	45	*77.6*	2	*3.4*	3	*5.2*	58
20 to 29	50	*9.7*	405	*78.8*	36	*7.0*	23	*4.5*	514
30 to 39	194	*15.6*	945	*75.9*	49	*3.9*	57	*4.6*	1,245
40 to 49	253	*16.8*	1,113	*73.7*	69	*4.6*	75	*5.0*	1,510
50 to 59	277	*19.1*	1,037	*71.6*	67	*4.6*	67	*4.6*	1,448
60 to 69	313	*21.2*	992	*67.3*	68	*4.6*	101	*6.9*	1,474
70 to 79	219	*19.9*	757	*68.9*	55	*5.0*	67	*6.1*	1,098
80 and older	88	*17.8*	330	*66.8*	34	*6.9*	42	*8.5*	494
REGION									
Northwest	360	*22.8*	1,093	*69.1*	55	*3.5*	74	*4.7*	1,582
North	386	*21.8*	1,232	*69.6*	74	*4.2*	77	*4.4*	1,769
Southwest	229	*14.7*	1,157	*74.4*	78	*5.0*	91	*5.9*	1,555
Central	139	*12.6*	807	*73.2*	79	*7.2*	78	*7.1*	1,103
East	286	*15.7*	1,331	*72.9*	94	*5.2*	114	*6.2*	1,825
SUBSITE									
Trunk	400	*15.8*	1,940	*76.4*	122	*4.8*	76	*3.0*	2,538
Upper Limb & Shoulder	312	*17.8*	1,335	*76.3*	63	*3.6*	39	*2.2*	1,749
Lower Limb & Hip	214	*13.4*	1,237	*77.2*	98	*6.1*	53	*3.3*	1,602
All Facial Sites	371	*32.4*	713	*62.3*	33	*2.9*	28	*2.4*	1,145
Scalp & Neck	74	*15.3*	338	*69.7*	45	*9.3*	28	*5.8*	485
Other Skin Subsites	32	*9.6*	70	*21.0*	20	*6.0*	211	*63.4*	333
VIRGINIA	**1,403**	***17.9***	**5,633**	***71.7***	**381**	***4.9***	**435**	***5.5***	**7,852**

Note. Other skin subsites include melanomas classified as overlapping lesion and skin, NOS. Total figures include 9 cases of unknown sex, 4 cases of unknown age, and 18 cases of unknown region. Data exclude 1,166 cases (12.9% of all melanoma) that are unstaged or missing stage data. Row percentages reflect the percentage of staged melanoma comprised of each stage. Percentages may not sum to 100 due to rounding.

Table C-9
Distribution of Melanoma of the Skin, Virginia, 1970-1996
Count and Percentage of Surgical Treatment by SEER Summary Stage

			In situ		Local		Regional		Distant	
TYPE OF SURGERY	Count	%	Count	%	Count	%	Count	%	Count	%
Biopsy only	1,231	13.7	311	*22.2*	305	*5.4*	12	*3.1*	76	*17.5*
Local tumor destruction without pathology	60	0.7	14	*1.0*	30	*0.5*	4	*1.0*	1	*0.2*
Simple excision with pathology	1,757	19.5	444	*31.6*	1,091	*19.4*	28	*7.3*	44	*10.1*
Biopsy followed by excision of lesion	100	1.1	45	*3.2*	45	*0.8*	1	*0.3*	2	*0.5*
Excision or local amputation without lymph node dissection	3,129	34.7	392	*27.9*	2,552	*45.3*	64	*16.8*	72	*16.6*
Any biopsy or excision with lymph node dissection	506	5.6	9	*0.6*	343	*6.1*	119	*31.2*	28	*6.4*
Amputation with or without lymph node dissection	37	0.4	0	--	23	*0.4*	10	*2.6*	4	*0.9*
Surgery of regional or distant site(s) or node(s)	1,324	14.7	81	*5.8*	983	*17.5*	113	*29.7*	113	*26.0*
Surgery , NOS	49	0.5	4	*0.3*	35	*0.6*	4	*1.0*	4	*0.9*
No reported surgery	825	9.1	103	*7.3*	226	*4.0*	26	*6.8*	91	*20.9*
TOTAL	**9,018**	**100**	**1,403**	***17.9***	**5,633**	***71.7***	**381**	***4.9***	**435**	***5.5***

Note. Total figures include 1,166 cases (12.9% of all melanoma) that are unstaged or missing stage data. Row percentages reflect the percentage of staged melanoma comprised of each stage. Data reflect the most invasive procedure that was reported for each patient. Percentages may not sum to 100 due to rounding.

Table C-10
Distribution of Melanoma of the Skin, Virginia, 1970-1996
Count and Percentage of Non-surgical Treatment by SEER Summary Stage

			In situ		Local		Regional		Distant	
NON-SURGICAL TREATMENT	Count	%	Count	%	Count	%	Count	%	Count	%
Radiation Only	113	*1.3*	1	*0.1*	25	*0.4*	9	*2.4*	69	*15.9*
Immunotherapy Only	105	*1.2*	0	--	65	*1.2*	20	*5.2*	15	*3.4*
Chemotherapy Only	101	*1.1*	0	--	25	*0.4*	19	*5.0*	52	*12.0*
Radiation and Chemotherapy	47	*0.5*	0	--	4	*0.1*	4	*1.0*	39	*9.0*
Chemotherapy and Other Therapy	18	*0.2*	0	--	0	--	3	*0.8*	13	*3.0*
Radiation, Chemotherapy, and Other Therapy	12	*0.1*	0	--	1	*0.0*	0	--	11	*2.5*
Non-surgical Therapy, NOS	11	*0.1*	1	*0.1*	6	*0.1*	2	*0.5*	2	*0.5*
Hormone Therapy Only	10	*0.1*	1	*0.1*	3	*0.1*	0	--	5	*1.1*
Radiation and Other Therapy	6	*0.1*	0	--	0	--	1	*0.3*	5	*1.1*
None Reported	8,595	*95.3*	1,400	*99.8*	5,504	*97.7*	323	*84.8*	224	*51.5*
All Treatments	**9,018**	***100.0***	**1,403**	***100.0***	**5,633**	***100.0***	**381**	***100.0***	**435**	***100.0***

Note. Other therapy refers to hormone therapy, immunotherapy, or non-surgical therapy, NOS. Data include in situ melanomas. Total figures include 1,166 cases (12.9% of all melanomas) that are unstaged or missing stage data. Of these cases, 22 received non-surgical treatment.

Table C-11
Distribution of Melanoma of the Skin, Virginia
Five-year Relative Survival Rate by Stage, Subsite and Sex, Virginia and SEER
Five-year Relative Survival Rate by Health Region, Virginia

	Virginia 1970-1989	SEER 1973-1989
ALL CASES	78.9 [a]	86.7
STAGE		
Local	86.4 [a]	92.2
Regional	41.7 [a]	57.3
Distant	14.4	15.3
SUBSITE		
Upper Limb and Shoulder	85.9	92.1
Lower Limb and Hip	83.4	89.6
All Facial Sites	82.5 [a]	93.5
Trunk	78.9 [a]	86.1
Scalp and Neck	68.3	79.6
SEX		
Males	73.6 [a]	83.4
Females	84.2 [a]	90.1
REGION		
North	83.8	n/a
Northwest	82.8	n/a
East	77.8	n/a
Southwest	76.7	n/a
Central	70.5	n/a

Note. Data include in situ melanomas.
[a] Significant difference from SEER rate ($p<.05$).

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